APPENDIX A

ELECTRONIC DATA

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APPENDIX B

SCREENING LEVEL EVALUATION OF INHALATION OF DUST EXPOSURE PATHWAY

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APPENDIX B

SCREENING LEVEL EVALUATION OF THE INHALATION OF DUST EXPOSURE PATHWAY

This appendix presents a screening level evaluation of the inhalation of dust (particulates released from soil into ambient air) exposure pathway identified in the conceptual site model to determine if this pathway requires further evaluation the risk assessment.

1.0 EXPOSURE VIA INHALATION OF PARTICULATES IN AIR

This section evaluates the dose of metals inhaled from particulates in air relative to the dose of metals ingested from soil.

Basic Approach

The basic equation recommended by EPA (1989) for evaluation of inhalation exposure is:

$$DI_{air} = C_a\ BR_a\ EF\ ED/(BW\ AT)$$

where:

DI_{air}	=	Daily intake from air (mg/kg-d)
C_a	=	Concentration of substance in air (mg/m^3)
BR_a	=	Breathing rate of air (m^3/day)
EF	=	Exposure frequency (days/yr)
ED	=	Exposure duration (yrs)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

and

$$C_a = k\ C_{soil}$$

where:

C_{soil}	=	Concentration of substance in soil (mg/kg)
k	=	soil to air transfer factor (kg/m^3)

The basic equation recommended by EPA (1989) for evaluation of soil ingestion is given by:

$$DI_{soil} = C_s\ IR_s\ EF\ ED/(BW\ AT)$$

where:

DI_{soil} = Daily intake from soil (mg/kg-d)
C_s = Concentration of substance in soil (mg/kg)
IR_s = Ingestion rate for soil (kg/day)
EF = Exposure frequency (days/yr)
ED = Exposure duration (yrs)
BW = Body weight (kg)
AT = Averaging time (days)

Based on the above equations, the relative magnitude of the inhaled dose of a COPC from air can be compared to the ingested dose from soil as follows:

$$\text{Ratio (inhalation / ingestion)} = k \quad BR_d / IR_s$$

Values for these parameters for each of the on-site receptors identified in the conceptual model are summarized below:

Parameter	RME Values				Source
	Commercial Worker	Construction Worker	Child Resident	Adult Resident	
k (kg/m^3)	7.4E-10	7.4E-10	7.4E-10	7.4E-10	EPA 2002
BR_a (m^3/day)	20	20	15.4	20	EPA 1997, 2002
IR_s (kg/day)	1E-04	3.3E-04	2.0E-04	1E-04	EPA 2002

Results

Based on these values, the ratio of the mass of soil inhaled to that ingested is as follows:

Receptor	DI_{air}/DI_{soil}
Commercial Worker	0.0003 (0.03%)
Construction Worker	0.00004 (0.004%)
Child Resident	0.00006 (0.01%)
Adult Resident	0.0002 (0.01%)

As seen, the inhaled dose of soil is very small (<<1%) compared to the ingested dose, so the inhalation pathway is not considered to be a significant exposure pathway at this site.

2.0 REFERENCES

EPA. 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual Part A. Interim Final. Office of Solid Waste and Emergency Response (OSWER), Washington, DC. OSWER Directive 9285.701A.

USEPA. 1997. Exposure Factors Handbook, Volumes I, II, and III. U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/P-95/002Fa.

USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December.

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APPENDIX C

DERIVATION OF ARSENIC RISK-BASED CONCENTRATIONS (RBCs) FOR SOIL

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RBC EQUATIONS:

CANCER

Total Cancer Risk = $Risk_{(groundwater\ ingestion)} + Risk_{(soil\ ingestion)}$

Where:

$Risk_{(groundwater\ ingestion)} = C_{gw} * HIF_{ingestion} * SF_o$

$Risk_{(soil\ ingestion)} = C_{soil} * HIFingestion * SF_o$

$$RBC_{cancer} = \frac{\text{Target Risk}}{(HIF_{ingestion} * SFo)}$$

NON-CANCER

Total Noncancer Risk = $Risk_{(groundwater\ ingestion)} + Risk_{(soil\ ingestion)}$

$Risk_{(groundwater\ ingestion)} = C_{gw} * HIF_{ingestion} / RfDo$

$Risk_{(soil\ ingestion)} = C_{soil} * HIF_{ingestion} / RfDo$

$$RBC_{noncancer} = \frac{\text{Target Risk}}{(HIF_{ingestion} / RfDo)}$$

Table C-1. Derivation of Arsenic RBCs for Soil

RECEPTOR	TOX VALUES [1]		RBCs		RBC	RBC Basis
	SFo	RfDo	Cancer	Noncancer	(mg/kg)	(Cancer/Noncancer)
Commercial Worker	6.30E-01	7.14E-04	907	1,461	907	Cancer
Construction Worker	6.30E-01	7.14E-04	2,646	850	850	Noncancer

[1] Note that the arsenic cancer slope factor (1.5E+00) and the noncancer reference dose (7.4E-01) have been adjusted by the site-specific soil RBA of 0.84.

HIFs_CANCER [2]		HIFs_NONCANCER [2]	
Commercial Worker	Construction Worker	Commercial Worker	Construction Worker
1.75E-07	6.00E-08	4.89E-07	8.40E-07

[2] See Tables 3-4 and 3-5 for HIF derivation.

TARGET RISK	
CANCER	1.00E-04
NONCANCER	1

APPENDIX D

SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCS)

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Table D-1. Soil COPC Selection

CHEMICAL	DATA						COPC SELECTION STEPS					SOIL COPCs		
										Essential Nutrient				
	Detection Frequency	Maximum Concentration (mg/kg) [1]	Essential Nutrient w/o Toxicity Data (Yes/No) [2]	Maximum Daily Dose (mg/day) [3]	Accepted Daily Dose (mg/day) [4]	Soil RBC (mg/kg) [5]	Does compound have a toxicity value?	Is Max Detect > RBC?	Is detection frequency ≥5%?	Is compound a non-toxic essential nutrient?	Does Max Dose >> Accepted Dose?	QUANT COPC	QUAL COPC	Not a COPC
Aluminum	100%	7,370	No	--	--	7,700	Yes	No	--	--	--			X
Antimony	83%	13	No	--	--	3.1	Yes	Yes	Yes	--	--	X		
Arsenic	90%	950	No	--	--	0.39	Yes	Yes	Yes	--	--	X		
Barium	100%	954	No	--	--	1,500	Yes	No	--	--	--			X
Beryllium	0%	0.5	No	--	--	16	Yes	No	--	--	--			X
Cadmium	92%	150	No	--	--	7	Yes	Yes	Yes	--	--	X		
Calcium	100%	25,900	Yes	8.547	1000	--	No	--	--	Yes	No			X
Chromium	100%	17	No	--	--	23	Yes	No	--	--	--			X
Cobalt	100%	4.0	No	--	--	2.3	Yes	Yes	Yes	--	--	X		
Copper	100%	681	No	--	--	313	Yes	Yes	Yes	--	--	X		
Iron	100%	53,200	No	--	--	5,500	Yes	Yes	Yes	--	--	X		
Lead	100%	34,000	No	--	--	400	Yes	Yes	Yes	--	--	X		
Magnesium	100%	3,350	Yes	1.1055	400	--	No	--	--	Yes	No			X
Manganese	100%	8,340	No	--	--	180	Yes	Yes	Yes	--	--	X		
Mercury	62%	2.0	No	--	--	2.30	Yes	No	--	--	--			X
Nickel	100%	7	No	--	--	150	Yes	No	--	--	--			X
Potassium	100%	3,350	Yes	1.1055	3500	--	No	--	--	Yes	No			X
Selenium	54%	4	No	--	--	39	Yes	No	--	--	--			X
Silver	100%	45	No	--	--	39	Yes	Yes	Yes	--	--	X		
Sodium	100%	1,360	Yes	0.45	2400	--	No	--	--	Yes	No			X
Thallium	100%	15	No	--	--	0.5	Yes	Yes	Yes	--	--	X		
Vanadium	100%	24	No	--	--	1.8	Yes	Yes	Yes	--	--	X		
Zinc	100%	19,000	No	--	--	2,300	Yes	Yes	Yes	--	--	X		

[1] Surface and subsurface soil combined. Subsurface soil data collected at depths greater than 10 feet were excluded.

[2] Based on USEPA 1994, Table 1. Chemicals identified by USEPA as essential nutrients for which toxicity data were not available were assigned a value of "Yes", whereas essential nutrients with toxicity data were assigned values of "No".

[3] Maximum expected daily dose for the maximally exposed receptor (construction worker), see Table D-2 for calculations.

[4] Values are either Reference Daily Intake (RDI) or Daily Reference Value (DRV). RDIs replace the term "U. S. Recommended Daily Allowances" (introduced in 1973 as a reference value for vitamins, minerals, and protein). DRVs are for nutrients for which no set of standards previously existed. Values obtained from http://www.fda.gov/fdac/special/foodlabel/dvs.html.

[5] Default soil screening level for residential soil, based on a target cancer risk of 1E-06 and a target noncancer Hazard Quotient of 0.1 (USEPA 2009).

Table D-2. Evaluation of Essential Nutrients

Media	Maximally Exposed Receptor	Essential Nutrient	Maximum Concentration (C_{max})		RME Intake Rate (IR)		Maximum Daily Intake [1] (mg/day)	Accepted Daily Intake [2] (mg/day)		Ratio
			value	units	value	units		value	Source	
Soil	Construction Worker	Calcium	25,900	mg/kg	330	mg/day	9	1000	RDI	0.01
		Magnesium	3,350	mg/kg	330	mg/day	1	400	RDI	0.003
		Potassium	3,350	mg/kg	330	mg/day	1	3500	DRV	0.0003
		Sodium	1,360	mg/kg	330	mg/day	0	2400	DRV	0.0002

[1] Calculated from maximum concentration and RME intake rate for the maximally exposed receptor (highest intake rate).
Max Daily Intake = C_{max} * IR. Conversion factors applied (as necessary) to yield daily intake in units of mg/day. Phosphorus in environmental media assumed to be present as phosphate. Maximum site concentration converted to phosphorus by multiplying by 0.316 (mass phosphorus/mass of phosphate).

[2] Valies are Reference Daily Intake (RDI) or Daily Reference Value (DRV). RDIs replace the term "U. S. Recommended Daily Allowances" (introduced in 1973 as a reference value for vitamins, minerals, and protein). DRVs are for nutrients for which no set of standards previously existed. Values obtained from http://www.fda.gov/fdac/special/foodlabel/dvs.html.

Table D-3. Regional Screening Tables
Risk-Based Concentrations (RBC)
(4/2009 update)

CHEMICAL	NOTE	CAS	BASIS (C/NC)	RESIDENTIAL SOIL (mg/kg)
Aluminum	[1]	7429-90-5	NC	7.70E+03
Antimony	[1]	7440-36-0	NC	3.10E+00
Arsenic	[1]	7440-38-2	C	3.90E-01
Barium	[1]	7440-39-3	NC	1.50E+03
Beryllium	[1]	7440-41-7	NC	1.60E+01
Cadmium	[1, 2]	7440-43-9	NC	7.00E+00
Calcium	[1]	7440-70-2	--	--
Chromium	[1, 3]	18540-29-9	NC	2.30E+01
Cobalt	[1]	7440-48-4	NC	2.30E+00
Copper	[1]	7440-50-8	NC	3.13E+02
Iron	[1]	7439-89-6	NC	5.50E+03
Lead	[1, 4]	7439-92-1	NC	4.00E+02
Magnesium	[1]	7439-95-4	--	--
Manganese	[1, 5]	7439-96-5	NC	1.80E+02
Mercury	[1, 6]	7487-94-7	NC	2.30E+00
Nickel	[1, 7]	7440-02-0	NC	1.50E+02
Potassium	[1]	7440-09-7	--	--
Selenium	[1]	7782-49-2	NC	3.90E+01
Silver	[1]	7440-22-4	NC	3.90E+01
Sodium	[1]	7440-23-5	--	--
Thallium	[1, 7]	7440-28-0	NC	5.10E-01
Vanadium	[1, 8]	NA	NC	1.80E+00
Zinc	[1]	7440-66-6	N	2.30E+03

-- not applicable, RBC not available for this compound

C = cancer

NC = noncancer

RBC =risk-based concentration

NOTES:

[1] As cited in the Regional Screening Tables (April 2009 update).
http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm (accessed May 26, 2009).
Values are based on a target HQ of 0.1 and a target cancer risk of 1E-06.

[2] Soil RBC is food-RBC.

[3] RBC for chromium VI (most conservative).

[4] Lead and compounds.

[5] Soil RBC is water-RBC.

[6] RBC for mercuric chloride.

[7] RBC for soluable salts.

[8] Vanadium and compounds.

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APPENDIX E

EXPOSURE POINT CONCENTRATIONS (EPCS)

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Table E-1. Exposure Point Concentrations for Surface Soil at Commercial Exposure Units

EXPOSURE UNIT	CHEMICAL	NUMBER OF SAMPLES	DETECTION FREQUENCY	CONCENTRATION (mg/kg)				DATA DISTRIBUTION	95th UCL METHOD		EXPOSURE POINT CONCENTRATION (mg/kg)
				MIN	MEAN	MAX	95th UCL				
C1	Antimony	--	--	--	--	--	--	--	--	--	--
	Arsenic	31	97%	1.4	12	52	23	Lognormal	95% KM (Chebyshev) UCL		23
	Cadmium	16	100%	0.6	3	8	4	Gamma or Lognormal	95% Approximate Gamma UCL		4
	Cobalt	--	--	--	--	--	--	--	--	--	--
	Copper	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Lead	31	100%	1.9	224	1,400	[1]	[1]	[1]		224
	Manganese	--	--	--	--	--	--	--	--	--	--
	Silver	2	100%	0.3	0.5	0.7	[3]	[3]	[3]		0.7
	Thallium	--	--	--	--	--	--	--	--	--	--
	Vanadium	--	--	--	--	--	--	--	--	--	--
	Zinc	14	100%	77	586	3,400	3,036	No discernable distribution	99% Chebyshev (Mean, Sd) UCL		3,036
C2	Antimony	6	83%	3.0	6	13	9	Lognormal or Normal	95% KM (t) UCL		9
	Arsenic	63	86%	3.8	51	510	98	Lognormal	95% KM (Chebyshev) UCL		98
	Cadmium	27	96%	0.5	12	100	36	No Discernable Distribution	97.5% KM (Chebyshev) UCL		36
	Cobalt	6	100%	3.0	3	4	4	No Discernable Distribution	95% Modified-t UCL		4
	Copper	6	100%	36	253	681	473	Lognormal or Normal	95% Student's-t UCL		473
	Iron	6	100%	12,000	22,033	53,200	38,856	Approximate Gamma	95% Approximate Gamma UCL		38,856
	Lead	52	100%	11.0	1,553	34,000	[1]	[1]	[1]		1,553
	Manganese	6	100%	328	2,011	8,340	7,128	Approximate Gamma	95% Approximate Gamma UCL		7,128
	Silver	6	100%	1.0	14	45	29	Normal	95% Student's-t UCL		29
	Thallium	6	100%	1.0	5	15	12	Lognormal or Gamma	95% Approximate Gamma UCL		12
	Vanadium	6	100%	18.0	20	24	22	Normal	95% Student's-t UCL		22
	Zinc	27	100%	130	1,535	14,000	8,355	No Discernable Distribution	99% Chebyshev (Mean, Sd) UCL		8,355

-- = Chemical not analyzed in soil at this exposure unit.
NA = Not Applicable.
R = Resdiential Exposure Unit

[1] Risks to lead are evaluated based on the mean concentration; a 95th UCL was not calculated.
[2] ProUCL recommended two different UCLs; the maximum value is presented.
[3] Inadequate number of observations to calculate a meaningful UCL (n<4).

Table E-2. Exposure Point Concentrations for Surface Soil at Residential Exposure Units

EXPOSURE UNIT	CHEMICAL	NUMBER OF SAMPLES	DETECTION FREQUENCY	CONCENTRATION (mg/kg)				DATA DISTRIBUTION	95th UCL METHOD		EXPOSURE POINT CONCENTRATION (mg/kg)
				MIN	MEAN	MAX	95th UCL				
R1	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	48	81%	3.8	38	420	58	Gamma or Lognormal	95% KM (BCA) UCL		58
	Cadmium	12	92%	0.5	7	37	19	No discernable distribution	95% KM (Chebyshev) UCL		19
	Cobalt	--	--	--	--	--	--	--	--		--
	Copper	--	--	--	--	--	--	--	--		--
	Iron	--	--	--	--	--	--	--	--		--
	Lead	39	100%	11.0	389	2,900	[1]	[1]	[1]		389
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	--	--	--	--	--	--	--	--		--
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	12	100%	130	263	460	317	Normal	95% Student's-t UCL		317
R2	Antimony	6	83%	3.0	6	13	9	Lognormal or Normal	95% KM (t) UCL	[2]	9
	Arsenic	19	100%	1.4	74	510	133	Lognormal or Gamma	95% Approximate Gamma UCL		133
	Cadmium	15	100%	2.0	16	100	34	Lognormal	95% Chebyshev (MVUE) UCL		34
	Cobalt	6	100%	3.0	3	4	4	No Discernable Distribution	95% Modified-t UCL	[2]	4
	Copper	6	100%	36	253	681	473	Normal	95% Student's-t UCL		473
	Iron	6	100%	12,000	22,033	53,200	38,856	Approximate Gamma	95% Approximate Gamma UCL		38,856
	Lead	17	100%	1.9	3,885	34,000	[1]	[1]	[1]		3,885
	Manganese	6	100%	328	2,011	8,340	7,128	Approximate Gamma	95% Approximate Gamma UCL		7,128
	Silver	6	100%	1.0	14	45	29	Normal	95% Student's-t UCL		29
	Thallium	6	100%	1.0	5	15	12	Gamma	95% Approximate Gamma UCL		12
	Vanadium	6	100%	18.0	20	24	22	Normal	95% Student's-t UCL		22
	Zinc	15	100%	190	2,552	14,000	14,341	No Discernable Distribution	99% Chebyshev (Mean, Sd) UCL		14,000
R3	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	10	100%	2.9	9	23	13	Approximate Gamma	95% Approximate Gamma UCL		13
	Cadmium	4	100%	0.6	2	3	[3]	[3]	[3]		3
	Cobalt	--	--	--	--	--	--	--	--		--
	Copper	--	--	--	--	--	--	--	--		--
	Iron	--	--	--	--	--	--	--	--		--
	Lead	10	100%	13.0	249	950	[1]	[1]	[1]		249
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	2	100%	0.3	1	1	[3]	[3]	[3]		1
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	2	100%	690	2,045	3,400	[3]	[3]	[3]		3,400
R4	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	17	94%	1.5	15	52	34	Lognormal or Gamma	95% KM (Chebyshev) UCL		34
	Cadmium	12	100%	0.9	3	8	5	Lognormal or Gamma	95% Approximate Gamma UCL		5
	Cobalt	--	--	--	--	--	--	--	--		--
	Copper	--	--	--	--	--	--	--	--		--
	Iron	--	--	--	--	--	--	--	--		--
	Lead	17	100%	12	235	1,400	[1]	[1]	[1]		235
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	--	--	--	--	--	--	--	--		--
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	12	100%	77	342	1,800	929	No Discernable Distribution	95% Chebyshev (Mean, Sd) UCL		929

-- = Chemical not analyzed in soil at this exposure unit.
NA = Not Applicable.
R = Resdiential Exposure Unit

[1] Risks to lead are evaluated based on the mean concentration; a 95th UCL was not calculated.
[2] ProUCL recommended two different UCLs; the maximum value is presented.
[3] Inadequate number of observations to calculate a meaningful UCL (n<4).

Table E-3. Exposure Point Concentrations for Surface Soil and Subsurface Soil at Commercial Exposure Units

EXPOSURE UNIT	CHEMICAL	NUMBER OF SAMPLES	DETECTION FREQUENCY	CONCENTRATION (mg/kg)				DATA DISTRIBUTION	95th UCL METHOD		EXPOSURE POINT CONCENTRATION (mg/kg)
				MIN	MEAN	MAX	95th UCL				
C1	Antimony	--	--	--	--	--	--	--	--	--	--
	Arsenic	74	99%	0.3	10	59	16	Lognormal or Gamma	95% KM (Chebyshev) UCL		16
	Cadmium	27	93%	0.6	3	8	3	Lognormal or Gamma	95% KM (BCA) UCL		3
	Cobalt	--	--	--	--	--	--	--	--	--	--
	Copper	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Lead	74	100%	1.1	273	3,600	[1]	[1]	[1]		273
	Manganese	--	--	--	--	--	--	--	--	--	--
	Silver	7	100%	0	1	4	2	Normal	95% Student's-t UCL		2
	Thallium	--	--	--	--	--	--	--	--	--	--
	Vanadium	--	--	--	--	--	--	--	--	--	--
	Zinc	20	100%	77	1,583	19,000	10,908	No Discernable Distribution	99% Chebyshev (Mean, Sd) UCL		10,908
C2	Antimony	6	83%	3.0	6	13	9	Normal or Lognormal	95% KM (t) UCL		9
	Arsenic	117	85%	2.9	48	950	97	No Discernable Distribution	95% KM (Chebyshev) UCL		97
	Cadmium	36	92%	0.3	17	150	49	No Discernable Distribution	97.5% KM (Chebyshev) UCL		49
	Cobalt	6	100%	3.0	3	4	4	No Discernable Distribution	95% Modified-t UCL		4
	Copper	6	100%	36	253	681	473	Normal	95% Student's-t UCL		473
	Iron	6	100%	12,000	22,033	53,200	38,856	Approximate Gamma	95% Approximate Gamma UCL		38,856
	Lead	106	100%	8.9	929	34,000	[1]	[1]	[1]		929
	Manganese	6	100%	328	2,011	8,340	7,128	Approximate Gamma	95% Approximate Gamma UCL		7,128
	Silver	6	100%	1.0	14	45	29	Normal	95% Student's-t UCL		29
	Thallium	6	100%	1.0	5	15	12	Approximate Gamma	95% Approximate Gamma UCL		12
	Vanadium	6	100%	18.0	20	24	22	Normal	95% Student's-t UCL		22
	Zinc	36	100%	26	1,244	14,000	6,414	No Discernable Distribution	99% Chebyshev (Mean, Sd) UCL		6,414

-- = Chemical not analyzed in soil at this exposure unit.
NA = Not Applicable.
R = Resdiential Exposure Unit

[1] Risks to lead are evaluated based on the mean concentration; a 95th UCL was not calculated.
[2] ProUCL recommended two different UCLs; the maximum value is presented.
[3] Inadequate number of observations to calculate a meaningful UCL (n<4).

Table E-4. Exposure Point Concentrations for Surface and Subsurface Soil at Residential Exposure Units

EXPOSURE UNIT	CHEMICAL	NUMBER OF SAMPLES	DETECTION FREQUENCY	CONCENTRATION (mg/kg)				DATA DISTRIBUTION	95th UCL METHOD		EXPOSURE POINT CONCENTRATION (mg/kg)
				MIN	MEAN	MAX	95th UCL				
R1	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	99	85%	2.9	43	950	95	No Discernable Distribution	95% KM (Chebyshev) UCL		95
	Cadmium	18	89%	0.3	19	150	74	No Discernable Distribution	97.5% KM (Chebyshev) UCL		74
	Cobalt	--	--	--	--	--	--	--	--		--
	Copper	--	--	--	--	--	--	--	--		--
	Iron	--	--	--	--	--	--	--	--		--
	Lead	90	100%	8.9	364	3,000	[1]	[1]	[1]		364
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	--	--	--	--	--	--	--	--		--
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	18	100%	26	264	530	321	Normal	95% Student's-t UCL		321
R2	Antimony	6	83%	3.0	6	13	9	Normal or Lognormal	95% KM (t) UCL	[2]	9
	Arsenic	30	90%	0.3	47	510	130	Lognormal or Gamma	95% KM (Chebyshev) UCL		130
	Cadmium	18	94%	0.3	14	100	38	Lognormal or Gamma	95% KM (Chebyshev) UCL		38
	Cobalt	6	100%	3.0	3	4	4	No Discernable Distribution	95% Modified-t UCL	[2]	4
	Copper	6	100%	36	253	681	473	Normal or Lognormal	95% Student's-t UCL		473
	Iron	6	100%	12,000	22,033	53,200	38,856	Approximate Gamma	95% Approximate Gamma UCL		38,856
	Lead	28	100%	1.1	2,363	34,000	[1]	[1]	[1]		2,363
	Manganese	6	100%	328	2,011	8,340	7,128	Approximate Gamma	95% Approximate Gamma UCL		7,128
	Silver	6	100%	1.0	14	45	29	Normal or Lognormal	95% Student's-t UCL		29
	Thallium	6	100%	1.0	5	15	12	Approximate Gamma	95% Approximate Gamma UCL		12
	Vanadium	6	100%	18.0	20	24	22	Normal or Lognormal	95% Student's-t UCL		22
	Zinc	18	100%	27	2,224	14,000	5,414	Lognormal	95% Chebyshev (MVUE) UCL		5,414
R3	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	30	100%	0.8	9	32	12	Approximate Gamma	95% Approximate Gamma UCL		12
	Cadmium	12	92%	0.6	2	6	3	Normal, Lognormal or Gamma	95% KM (t) UCL	[2]	3
	Cobalt	--	--	--	--	--	--	--	--	--	--
	Copper	--	--	--	--	--	--	--	--	--	--
	Iron	--	--	--	--	--	--	--	--	--	--
	Lead	30	100%	1.5	310	1,900	[1]	[1]	[1]		310
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	7	100%	0.3	1	4	2	Normal	95% Student's-t UCL		2
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	5	100%	180	1,426	3,400	2,764	Normal	95% Student's-t UCL		2,764
R4	Antimony	--	--	--	--	--	--	--	--		--
	Arsenic	32	97%	1.2	14	59	26	Lognormal or Gamma	95% KM (Chebyshev) UCL		26
	Cadmium	15	93%	0.9	3	8	5	Lognormal or Gamma	95% KM (Chebyshev) UCL		5
	Cobalt	--	--	--	--	--	--	--	--		--
	Copper	--	--	--	--	--	--	--	--		--
	Iron	--	--	--	--	--	--	--	--		--
	Lead	32	100%	12	325	3,600	[1]	[1]	[1]		325
	Manganese	--	--	--	--	--	--	--	--		--
	Silver	--	--	--	--	--	--	--	--		--
	Thallium	--	--	--	--	--	--	--	--		--
	Vanadium	--	--	--	--	--	--	--	--		--
	Zinc	15	100%	77	1,635	19,000	14,027	No Discernable Distribution	99% Chebyshev (Mean, Sd) UCL		14,027

-- = Chemical not analyzed in soil at this exposure unit.
NA = Not Applicable.
R = Resdiential Exposure Unit

[1] Risks to lead are evaluated based on the mean concentration; a 95th UCL was not calculated.
[2] ProUCL recommended two different UCLs; the maximum value is presented.

Table E-5.
Surface Water
Exposure Point Concentrations (EPCs)
TOTAL FRACTION

EXPOSURE UNIT	CHEMICAL	FRACTION	NUMBER OF SAMPLES	CONCENTRATION (ug/L)			DATA DISTRIBUTION	95th UCL METHOD	EXPOSURE POINT CONCENTRATION (ug/L)
				MEAN	MAX	95th UCL			
N43	Arsenic	total	4	1.2	1.5	--	--	--	1.5
	Cadmium	total	4	0.1	0.2	--	--	--	0.2
	Copper	total	4	5.2	6.4	--	--	--	6.4
	Lead [1]	total	4	2	5	--	--	--	2.0
	Zinc	total	4	32	35	--	--	--	35
N46	Arsenic	total	4	1.2	1.2	--	--	--	1.2
	Cadmium	total	4	0.2	0.2	--	--	--	0.2
	Copper	total	4	7	13	--	--	--	13
	Lead [1]	total	4	2	5.4	--	--	--	2.0
	Zinc	total	4	36	40	--	--	--	39.0

NA = Not Applicable.

-- Due to sample size (less than 10), a 95th UCL was not calculated.

[1] Risks to human receptors from lead are evaluated based on the mean concentration.

Table E-6.
Sediment
Exposure Point Concentrations (EPCs)

EXPOSURE UNIT	CHEMICAL	NUMBER OF SAMPLES	CONCENTRATION (mg/kg)			DATA DISTRIBUTION	95th UCL METHOD	EXPOSURE POINT CONCENTRATION (mg/kg)
			MEAN	MAX	95th UCL			
N43 (upgradient)	Arsenic	4	1.5	1.9	--	--	--	1.9
	Cadmium	4	0.6	0.9	--	--	--	0.9
	Copper	4	17	20	--	--	--	20
	Lead [1]	4	164	550	--	--	--	164
	Zinc	4	97	110	--	--	--	110
N46 (downgradient)	Arsenic	4	1	2	--	--	--	2
	Cadmium	4	0.4	0.6	--	--	--	0.6
	Copper	4	14	19	--	--	--	19
	Lead [1]	4	25	31	--	--	--	25
	Zinc	4	95	110	--	--	--	110

NA = Not Applicable.
-- Due to sample size (less than 10), a 95th UCL was not calculated.

[1] Risks to human receptors from lead are evaluated based on the mean concentration.

APPENDIX F

DETAILED RISK CALCULATIONS

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SEE ATTACHED CD